

Show all work.

1. Find the equation in slope intercept form for the line containing the points (3, -17) and (-4, 18).

$$\frac{-17-18}{3-(-4)} = \frac{-35}{7} = -5$$

$$y-18 = -5(x+4)$$

$$y-18 = -5x-20$$

$$y = -5x - 2$$

2. Find the domain of

$$f(x) = \sqrt{2(x-3)} - 1.$$

$$2(x-3) - 1 \geq 0 \quad \left[\frac{7}{2}, \infty\right)$$

$$2x - 6 - 1 \geq 0$$

$$2x \geq 7$$

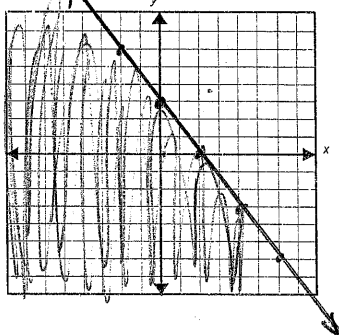
$$x \geq \frac{7}{2}$$

3. Graph the linear inequality

$$3x + 2y \leq 6$$

$$2y \leq -3x + 6$$

$$y \leq -\frac{3}{2}x + 3$$



4. Solve:  $\frac{3y+4}{10} = \frac{y}{5}$

$$15y + 20 = 10y$$

$$5y = -20$$

$$y = -4$$

5. Simplify:  $\sqrt[4]{81x^{12}y^2z^{15}}$

$$3x^3z^3\sqrt[4]{y^2z^3}$$

6. Solve:  $|2x-2| = 5$

$$2x-2 = 5$$

$$2x = 7$$

$$x = \frac{7}{2}$$

$$2x-2 = -5$$

$$2x = -3$$

$$x = -\frac{3}{2}$$

7. Let  $f(x) = 3x - 4$  and  $g(x) = -2x^2$ . Find the following.

a.  $(g-f)(x)$

$$-2x^2 - (3x-4) = -2x^2 - 3x + 4$$

b.  $(f \cdot g)(x)$

$$(-2x^2)(3x-4) = -6x^3 + 8x^2$$

c.  $\left(\frac{g}{f}\right)(x)$

$$\frac{-2x^2}{3x-4}; x \neq \frac{4}{3}$$

d.  $(g \circ f)(x)$

$$g(3x-4) \rightarrow -2(3x-4)^2$$

$$-2(9x^2 - 24x + 16) \rightarrow -18x^2 + 48x - 32$$

e.  $(f \circ g)(-3) \rightarrow -2(-3)^2 = -18$

$$3(-18) - 4 = -58$$

8. Solve by substitution:

$$\begin{cases} y = 12x - 3 \\ 4x - y = -1 \end{cases}$$

$$4x - (12x - 3) = -1$$

$$4x - 12x + 3 = -1$$

$$-8x = -4$$

$$x = \frac{1}{2}$$

$$\left(\frac{1}{2}, 3\right)$$

9. Evaluate:  $5 + (6 - 2^2) - 12 \div 2 \times 3$

$$5 + 2 - 18$$

$$-11$$

10. Find the inverse of  $f(x) = \frac{3x-4}{5}$ .

$$x = \frac{3y-4}{5}$$

$$3y-4=5x$$

$$3y=5x+4$$

$$f^{-1}(x) = \frac{5x+4}{3}$$

$$y = \frac{5x+4}{3}$$

11. Simplify:  $(7+3i)(2-5i)$

$$14 - 35i + 6i - 15i^2$$

$$14 - 29i + 15$$

$$29 - 29i$$

12. What is the conjugate of  $8-5i$ ?

$$8+5i$$

13. Factor:  $9x^2 - 6x + 1$

$$(3x-1)(3x-1)$$

$$(3x-1)^2$$

14. Find the roots:  $x^2 + 4x - 9 = 0$

$$\frac{-4 \pm \sqrt{16 - 4(1)(-9)}}{2} = \frac{-4 \pm \sqrt{52}}{2}$$

$$\frac{-4 \pm 2\sqrt{13}}{2} = -2 \pm \sqrt{13}$$

15. How many ways can you choose 2 books from a set of 10?

$${}_{10}C_2 = 45 \text{ ways}$$

16. Write as a single logarithm:

$$3\log_2 x + 5\log_2 y$$

$$\log_2 x^3 + \log_2 y^5 = \log_2 x^3 y^5$$

17. Solve:  $\left(\frac{2\sqrt{2x-3}}{2}\right)^2 = \frac{10}{2}$

$$(\sqrt{2x-3})^2 = (5)^2$$

$$2x-3 = 25$$

$$2x = 28$$

$$x = 14$$

18. A lab sample contains 400 bacteria that increases by 9% every hour. Predict the number of bacteria after 3 hours.

$$400(1.09)^3$$

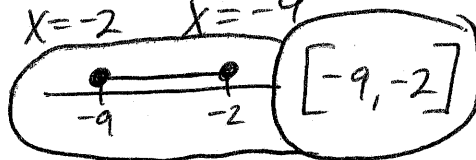
$$518.01 \text{ bacteria}$$

19. Graph the solution:

$$x^2 + 11x + 18 \leq 0$$

$$(x+2)(x+9)$$

$$x = -2 \quad x = -9$$



20. Find the distance between  $(6, -2)$  and  $(2, 4)$ .

$$d = \sqrt{(6-2)^2 + (-2-4)^2}$$

$$\sqrt{16 + 36} = \sqrt{52} =$$

$$d = 2\sqrt{13}$$

21. Simplify:  $(3+2\sqrt{50}) - (6+3\sqrt{8})$

$$3 + 2\sqrt{50} - 6 - 3\sqrt{8}$$

$$3 + 10\sqrt{2} - 6 - 6\sqrt{2}$$

$$-3 + 4\sqrt{2}$$

Show all work.

1. Find an equation in slope-intercept line form for the line that contains  $(-2, -3)$  and parallel to the line  $3x + 4y = 9$ .

$$\begin{aligned} 3x + 4y &= 9 \\ 4y &= -3x + 9 \\ y &= -\frac{3}{4}x + \frac{9}{4} \end{aligned}$$

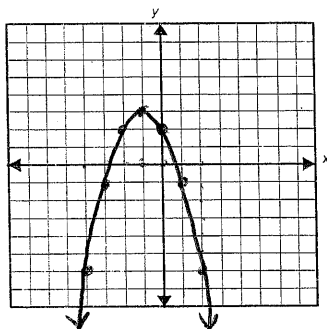
$$\begin{aligned} y + 3 &= -\frac{3}{4}(x + 2) \\ y + 3 &= -\frac{3}{4}x - \frac{3}{2} \\ y &= -\frac{3}{4}x - \frac{9}{2} \end{aligned}$$

2. Find the final amount for the investment of \$10,000 earning 8% interest compounded monthly for 12 years.

$$\begin{aligned} 10,000 \left(1 + \frac{.08}{12}\right)^{144} &= \\ 10,000 (1.00667)^{144} &= \boxed{26033.89} \end{aligned}$$

3. Graph the quadratic function  $y = -(x+1)^2 + 3$ .

x	y
0	2
1	-1
2	-6
-3	-1
-4	-6



4. Solve for  $x$ :  $2x^2 - 15 = 8x$ .

$$\begin{aligned} 2x^2 - 8x - 15 &= 0 \\ \frac{8 \pm \sqrt{64 - 4(2)(-15)}}{4} &= \frac{8 \pm \sqrt{184}}{4} = \frac{8 \pm 2\sqrt{46}}{4} = \frac{4 \pm \sqrt{46}}{2} \end{aligned}$$

5. Solve for  $x$ :

$$\begin{aligned} \log_2 x + \log_2 (x-4) &= 5 \\ \log_2 (x^2 - 4x) &= 5 \\ 2^5 &= x^2 - 4x \\ x^2 - 4x - 32 &= 0 \\ (x-8)(x+4) &= 0 \end{aligned}$$

6. Solve:  $|3x+5| > 2$

$$\begin{aligned} 3x+5 &> 2 & 3x+5 < -2 \\ 3x &> -3 & 3x < -7 \\ x &> -1 & x < -\frac{7}{3} \end{aligned}$$

7. Use factoring to solve for  $x$ :

a.  $3x^3 + 3x^2 = 6x$

$$\begin{aligned} 3x^3 + 3x^2 - 6x &= 0 \\ 3x(x^2 + x - 2) &= 0 \\ 3x(x+2)(x-1) &= 0 \end{aligned}$$

$x=0$   
 $x=1$   
 $x=-2$

b.  $(x^3 - 2x^2) - 4x + 8 = 0$

$$\begin{aligned} x^2(x-2) - 4(x-2) &= 0 \\ (x^2-4)(x-2) &= 0 \\ (x+2)(x-2)(x-2) &= 0 \end{aligned}$$

$x=2$   
 $x=-2$

8. Evaluate the expression:

$$3(\sqrt[3]{-27})^2 = \boxed{27}$$

9. Find the vertex,  $y$ -intercept, and  $x$ -intercepts of

$$\begin{aligned} y &= x^2 + 4x - 5 \\ (x+5)(x-1) &= 0 \\ x &= \frac{-4}{2} = -2 \rightarrow \text{vertex: } (-2, -9) \\ x &= -5 \quad x = 1 \end{aligned}$$

$y_{\text{int}}: (0, -5)$   
 $x_{\text{int}}: (-5, 0), (1, 0)$

10. Simplify the expression:

a.  $\frac{6-2i}{-4+i} \cdot \frac{(-4-i)}{(-4-i)} = \frac{-24+2i+2}{16+1}$

$$\frac{-22+2i}{17}$$

b.  $(4-5i)^2$

$$\boxed{-9-40i}$$

11. Evaluate:
- $i^{53}$

$$\boxed{i}$$

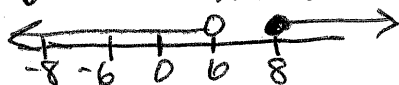
12. Solve and graph the solution:

$$3x - 6 < 12 \text{ and } 1 - 2x \leq 17$$

$$3x < 18 \quad -2x \leq 16$$

$$x < 6$$

$$x \geq 8$$



13. Solve for
- $a$
- :
- $S = \frac{1}{2}(a + b + c)$
- .

$$2S = a + b + c$$

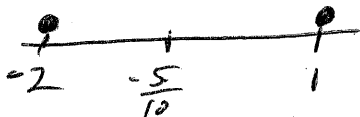
$$\boxed{a = 2S - b - c}$$

14. Solve for
- $x$
- :
- $|10x + 5| - 7 = 8$
- .

$$|x + \frac{5}{10}| = \frac{15}{10}$$

$$x = -\frac{5}{10}$$

$$|10x + 5| = 15$$



$$\begin{cases} -2 \\ 1 \end{cases}$$

15. Simplify the expression with positive exponents only:

$$\left(\frac{5c^{-2}}{z^3}\right)\left(\frac{c^3z^3}{x}\right)^{-2}$$

$$\frac{5}{c^2z^3} \cdot \frac{1}{c^6z^6x} = \boxed{\frac{5}{c^8z^9x}}$$

16. Find the
- $f(-2)$
- when

$$f(x) = \frac{1}{2}x^3 + 2x^2 - 4x$$

$$-4 + 8 + 8$$

$$\boxed{12}$$

17. Complete:
- $\sqrt{-36} =$

$$\boxed{6i}$$

18. Find the midpoint of the segment joining two given points:

$$(-6, 4) \text{ and } (2, -2)$$

$$\left(\frac{-6+2}{2}, \frac{4-2}{2}\right) = \boxed{(-2, 1)}$$

19. Describe the transformation from the parent function
- $y = x^2$
- :

$$y = -\frac{1}{3}(x-2)^2 + 5$$

reflection over  $x$  axis; vertical compression by a factor of  $\frac{1}{3}$ ; shift RIGHT 2; shift UP 5.

20. Write a function for the graph described:

The graph  $y = \sqrt{x}$  is reflected across the  $y$  axis, horizontal stretch by the factor 2, and translated vertically 5.

$$y = -\sqrt{\frac{x}{2}} + 5$$

21. Find the discriminant and describe the nature of the solutions.

a.  $4x^2 + 9 = 2x$

b.  $x^2 + 16 = 8x$

Show all work.

1. Solve and graph the following absolute value inequality

$$|x+5| \geq 45$$

$x+5=0$   
 $x=-5$

2. Let  $f(x) = 3x - 4$  &  $g(x) = x^2 + 1$   
 Find each new function

$$f+g$$

$$(3x-4) + (x^2+1)$$

$$(x^2+3x-3)$$

$$f(g(3))$$

$$3(10)-4$$

$$26$$

3. Simplify the following expression

$$\frac{(2x)^3}{y^2} \cdot \left(\frac{x^2}{3}\right)^3 = \frac{8x^3}{y^2} \cdot \frac{x^6}{27}$$

$$\frac{8x^9}{27y^2}$$

4. Use elimination to solve the following system.

$$\begin{array}{r} -3(2x-5y)=1 \rightarrow -6x+15y=-3 \\ 2(3x-4y)=-2 \rightarrow 6x-8y=-4 \\ \hline 7y=-7 \\ y=-1 \\ x=-2 \end{array}$$

$(-2, -1)$

5. Write the function in standard form

$$f(x) = (x-3)(x+8)$$

$$x^2+5x-24$$

6. Solve  $4x^2 + 13 = 253$ . Give the exact solution.

$$4x^2 = 240$$

$$x^2 = 60$$

$$x = \pm 2\sqrt{15}$$

7. Solve  $9(x-2)^2 = 121$

$$(x-2)^2 = \frac{121}{9}$$

$$x-2 = \pm \sqrt{\frac{121}{9}}$$

$$x-2 = \pm \frac{11}{3}$$

$$x = \frac{17}{3}$$

8. Factor  $x^2 - 7x - 30$

$$(x+3)(x-10)$$

$$x = -3, x = 10$$

9. Factor  $6x^2 + 11x + 3$

$$6x^2 + 9x + 2x + 3$$

$$3x(2x+3) + 1(2x+3)$$

10. Use the quadratic formula to find the roots of  $x^2 + 5x - 14 = 0$ .

$$\frac{-5 \pm \sqrt{25 - 4(1)(-14)}}{2} = \frac{-5 \pm \sqrt{81}}{2}$$

$$\frac{-5 \pm 9}{2} = 2, -7$$

$x = 2$   
 $x = -7$

11. Find the slope of the line containing the points  $(2, -1)$  and  $(-5, 0)$ .

$$\frac{0+1}{-5-2} = \frac{1}{-7} = -\frac{1}{7}$$

12. Write an equation that contains the point  $(-4, 6)$  and is parallel to the graph of  $y = -2x - \frac{1}{4}$

$$y-6 = -2(x+4)$$

$$y+6 = -2x-8$$

$$y = -2x-2$$

13. Find the equation of the line containing the points  $(-3, 6)$  &  $(-5, 8)$ .

$$\frac{8-6}{-5-3} = \frac{2}{-2} = -1$$

$$\begin{aligned} y-8 &= -1(x+5) \\ y-8 &= -x-5 \\ y &= -x+3 \end{aligned}$$

14. Write the equation in exponential form

$$\log_6 36 = 2$$

$$6^2 = 36$$

15. Write each equation in logarithmic form

$$\left(\frac{1}{4}\right)^{-3} = 64$$

$$\log_{\frac{1}{4}} 64 = -3$$

16. Evaluate  $\log_5 25^4$

$$\log_5 (5^2)^4 = 8$$

17. Solve  $\log_2(x^2 + 7x - 5) = \log_2(6x + 1)$  for  $x$ .

$$x^2 + 7x - 5 = 6x + 1$$

$$x^2 + x - 6 = 0$$

$$(x+3)(x-2) = 0$$

$$x = -3 \quad x = 2$$

18. Simplify the following expression

$$(27ab^3)^{\frac{1}{3}} \cdot \sqrt[3]{5a^4b}$$

$$\sqrt[3]{27ab^3} \cdot \sqrt[3]{5a^4b}$$

$$\sqrt[3]{135a^5b^4} =$$

$$3ab \sqrt[3]{5a^2b}$$

19. Simplify the following expression

$$\frac{8(54x^5)^{\frac{1}{2}}}{4\sqrt{3x^3}} = \frac{28\sqrt{54x^5}}{4\sqrt{3x^3}}$$

$$\frac{2\sqrt{18x^5}}{6x\sqrt{2}}$$

20. Simplify the following product

$$\begin{aligned} &(-3 + \sqrt{32})(4 + 2\sqrt{2}) \\ &-12 - 6\sqrt{2} + 4\sqrt{32} + 2\sqrt{64} \\ &-12 - 6\sqrt{2} + 16\sqrt{2} + 16 \\ &4 + 10\sqrt{2} \end{aligned}$$

21. Find the zeros of the quadratic function

$$f(x) = x^2 + 9x + 18$$

$$(x+6)(x+3)$$

$$x = -6 \quad x = -3$$

22. Find the domain of the radical function

$$f(x) = \sqrt{3x-1}$$

$$3x-1 \geq 0$$

$$x \geq \frac{1}{3}$$

$$\left[\frac{1}{3}, \infty\right)$$

23. Solve the equation by factoring and applying zero product property

$$x^2 + 3x = 28$$

$$x^2 + 3x - 28 = 0$$

$$(x+7)(x-4) = 0$$

$$x = -7 \quad x = 4$$

24. Solve  $\sqrt[3]{x-5} = \sqrt[3]{7-x}$

$$x-5 = 7-x$$

$$2x = 12$$

$$x = 6$$

25. Solve  $\sqrt{x+1} < 2$

$$x+1 < 4$$

$$x < 3$$

26. Simplify the expression

$$\frac{x^2 + 2x - 3}{x^2 + 5x + 6} \div \frac{4x^2 - 4x}{x^2 + 3x + 2}$$

1. Simplify:  $\left(\frac{81}{16}\right)^{-\frac{1}{4}} = \left(\frac{16}{81}\right)^{\frac{1}{4}} =$

$$\left(\frac{2}{3}\right)$$

2. Given that the roots of a function are  $x = 2$  and  $x = -5$ , find the quadratic function.

$$(x-2)(x+5) = 0$$

$$x^2 + 3x - 10 = 0$$

3. Solve the system:

$$\begin{cases} 2x + 11y = 18 \\ 5x + 3y = -4 \end{cases}$$

$$10x + 55y = 90$$

$$-10x - 6y = 8$$

$$49y = 98$$

$$y = 2$$

$$x = -2$$

$$(-2, 2)$$

4. Write in exponential form:

$\log_5 x = -2$ . What is the value of  $x$ ?

$$5^{-2} = x$$

$$x = \frac{1}{25}$$

5. What is the equation for the axis of symmetry of  $f(x) = -x^2 + 4x + 9$ ?

$$x = \frac{-b}{2a} = x = \frac{-4}{-2} = x = 2$$

6. Classify the conic section defined by each equation.

a.  $x^2 + 2x + y^2 + 6y = 15$

b.  $9x^2 - 3 = 18x + 4y$

c.  $4x^2 + 8x - 9y^2 + 36y - 68 = 0$

d.  $x^2 - 8y - 16 = 4y^2 + 4x$

e.  $9y^2 + 18y + 9 = 24x - 4x^2$

7. Rationalize the denominator:

$$\frac{4}{3-\sqrt{5}} \cdot \frac{3+\sqrt{5}}{3+\sqrt{5}} = \frac{4(3+\sqrt{5})}{4}$$

$$3+\sqrt{5}$$

8. What is the center and radius of the circle having the equation  $(x-3)^2 + (y+1)^2 = 36$

9. What is the multiplier for a decay of 13%?

$$1 - .13 = .87$$

10. Solve:

a.  $x^2 - 25 = 0$

$$(x-5)(x+5) = 0$$

$$x = 5, x = -5$$

b.  $x^2 + 25 = 0$

$$\sqrt{x^2 + 25} = 0$$

$$x = \pm 5i$$

c.  $2x^2 + 9x - 5 = 0$

$$(2x+10)(x-5) = 0$$

$$2x(x+5) - 1(x+5) = 0$$

$$(2x-1)(x+5) = 0$$

$$x = -5, x = \frac{1}{2}$$

d.  $x^2 - 7 = 2x$

$$x^2 - 2x - 7 = 0$$

$$\frac{2 \pm \sqrt{4 - 4(1)(-7)}}{2} = \frac{2 \pm \sqrt{32}}{2}$$

$$\frac{2 \pm 4\sqrt{2}}{2} = 1 \pm 2\sqrt{2}$$

e.  $3x^3 + 3x^2 - 6x = 0$

$$3x(x^2 + x - 6) = 0$$

$$3x(x+3)(x-2) = 0$$

11. Solve for x:

a.  $\log_x 32 = 5 \Rightarrow x^5 = 32; x = 2$

b.  $\log_3 \left( \frac{1}{27} \right) = x \Rightarrow 3^x = \frac{1}{27}; x = -3$

c.  $\log 1000 = x \Rightarrow 10^x = 1000; x = 3$

d.  $\log_{\frac{1}{2}} x = -4 \Rightarrow \frac{1}{2}^{-4} = x; x = 16$

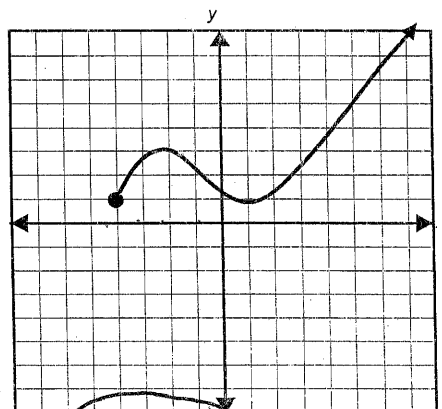
~~12.~~ Given is the equation for a circle.  
Rewrite it in standard form.

$$x^2 + y^2 - 20x + 10y + 61 = 0$$

~~13.~~ Given is the equation for an  
hyperbola. Rewrite it in standard  
form.  $9x^2 - 4y^2 - 18x + 8y = 31$

14.  $i^{94} = -1$

15. What is the domain of the graphed function?



$$[-4, \infty)$$